

# Four Macromolecules of Life

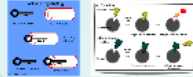
**Dehydration Synthesis:**

- When compounds come together, they lose water.
- Example: monomers join together to form a polymer

**Hydrolysis:**

- Water is added to a molecule to break it down.
- Example: breaking up polymers

## Look and Key Theory:



## Enzymes

Carry out or catalyze (speed up) reactions taking place in the body or cells.

Usually end in -ase or -in

Example: amylase, pepsin

**Notes:**  
Enzymes catalyze reactions by decreasing the activation energy.

## Functions:

Cells use carbohydrates to store and release energy.

Starch: energy source for animals

Cellulose: plants and other invertebrate animals rely on provide structure and support.

## Proteins

**VITAL**

Supplies structure for organs and tissues; Carries out cell metabolism.

**Components:**  
H, C, N, O, & S



## Carbohydrates ["Carbon", "Oxygen", "Hydrogen"]

Are made up of Oxygen and Hydrogen

Monosaccharide - simple sugars that make up carbohydrates "sugars"

Example: Glucose, Fructose

Disaccharide - two simple sugars joined together "sugars"

Example: sucrose

Polymer - complex carbohydrates "sugars"

Example: starch, cellulose, glycogen

## Macromolecules "Big"

- Carbohydrates
- Lipids
- Proteins
- Nucleic Acids

## Lipids

- Types of lipids:
  1. Fats
  2. Phospholipids
  3. Steroids
  4. Triglycerides
  5. Waxes

Lipids are the main source of energy insulation, and in the case of the steroid hormones, if the steroid hormones they are crucial.

## Nucleic Acids

Genes are genetic information

Its vital roles: Coding, assembling, regulating, and expression of genes.

Nucleic Acids stores and transmits in the form of genetic code.

Composed of Carbon, Oxygen, Hydrogen, Nitrogen, and Phosphorus

Main Forms:

- DNA
- RNA
- mRNA, tRNA, rRNA



## Phospholipids:

- Hydrophilic - water
- Hydrophobic - water
- Phosphate - water
- Glycerol - water
- Hydrophobic - water
- Fatty acid - water



## What are they composed of?

Long complex chains of molecules (polymers) made up of simpler, smaller subunits (monomers)



- Two Major parts of lipid molecules:
- Glycerol (pharmaceutical uses)
  - Fatty Acid chains (important source of fuel for your body)

## Lipids from...

Plants contain both saturated and unsaturated fats

Animals contain only saturated fatty acid chains

Unsaturated: Double bonds (chemical bonds between 2 chemical elements)

Saturated: No double bonds



Macromolecules Done With



## Macromolecules "Big"

- Carbohydrates
- Lipids
- Proteins
- Nucleic Acids



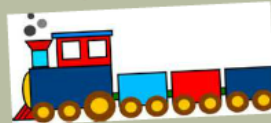
# What are they composed of?

long complex chains of molecules  
(polymers) made up of simpler,  
smaller subunits (monomers)

Just think of it like this

Polymer

poly= many



monomer - monomer - monomer - monomer

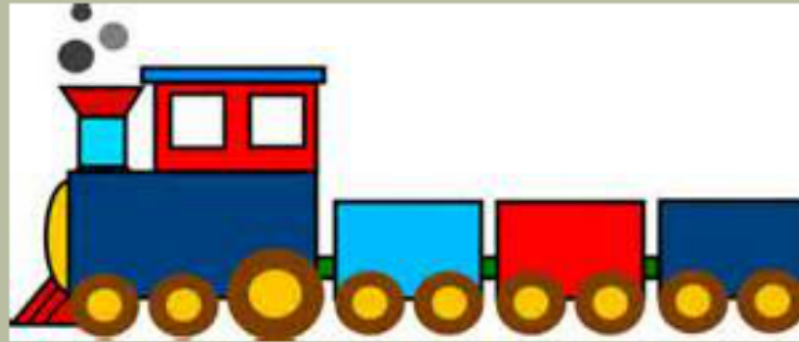
mono= one



Just think of it like this

Polymer

poly = many



monomer - monomer - monomer - monomer

mono = one



# Carbohydrates

["Carbon" "Oxygen" "Hydrogen"]

are made up of sugars and their polymers

monosaccharide = simple sugars that make up carbohydrates

sugar"

# Carbohydrates

["Carbon" "Oxygen" "Hydrogen"]

are made up of sugars and their polymers

Monosaccharide = simple sugars that make up carbohydrates  
"one" "sugar"

Examples: Glucose, fructose

Disaccharide=when two simple sugars bond together  
"two" "sugars"

Example: sucrose

Polysaccharide= complex carbohydrates  
"many" "sugars"

Examples: starch, cellulose, chitin

## Functions:

Cells use carbohydrates to store and release energy.

Starch= energy source for plants



Glycogen= energy source for animals



Cellulose in plants and chitin in invertebrate animals help to provide structure and support.

# Lipids

## Types of lipids

1. Fats
2. Phospholipids
3. Oils
4. Waxes
5. Steroids
6. Triglycerides

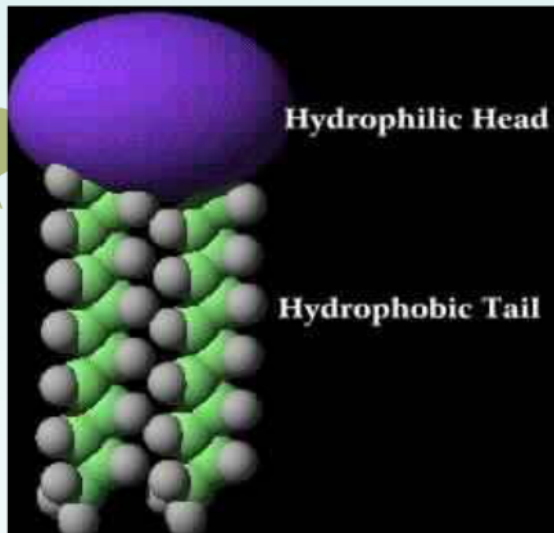
Lipids are excellent sources of energy, insulation, and in the case of the dual nature of the phospholipid, they are elements of membranes.



ols  
axes  
teroids  
triglycerides

Lipids are excellent sources of energy, insulation, and, in the case of the dual nature of the phospholipid, they are crucial elements of membranes.

# Phospholipids:



Hydrophilic Head= Polar  
Hydrophobic Tail= Non-Polar

If hydro = water  
and  
phobia = fear  
and  
philos = loving  
then...

Hydrophobic = water  
fearing  
Hydrophilic = water  
loving

Phosp

Located in

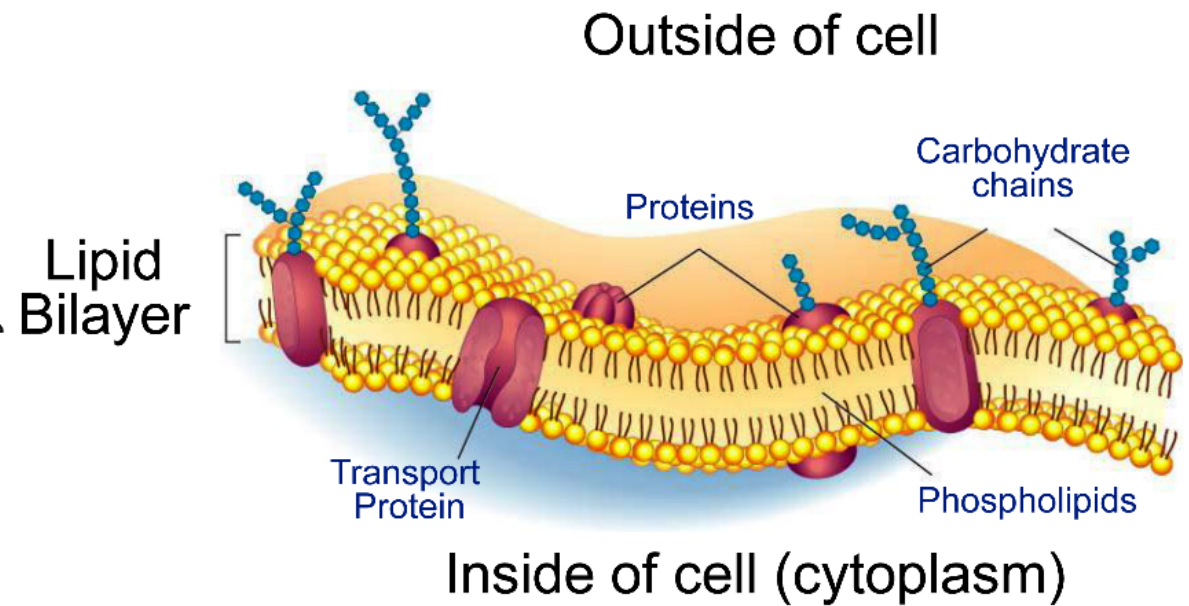
This struc  
movement  
the cell.

# Phospholipid Bilayer

Located in the membrane of a cell

This structure helps control the movement of substances in and out of the cell.

## Structure of the Cell Membrane



Two Major parts of lipid molecules:

- Glycerol (pharmaceutical Uses)
- Fatty Acid Chains (important Source of fuel for your body)

## Lipids from...

Plants contain both saturated and unsaturated fats

Animals contain only saturated fatty acid chains

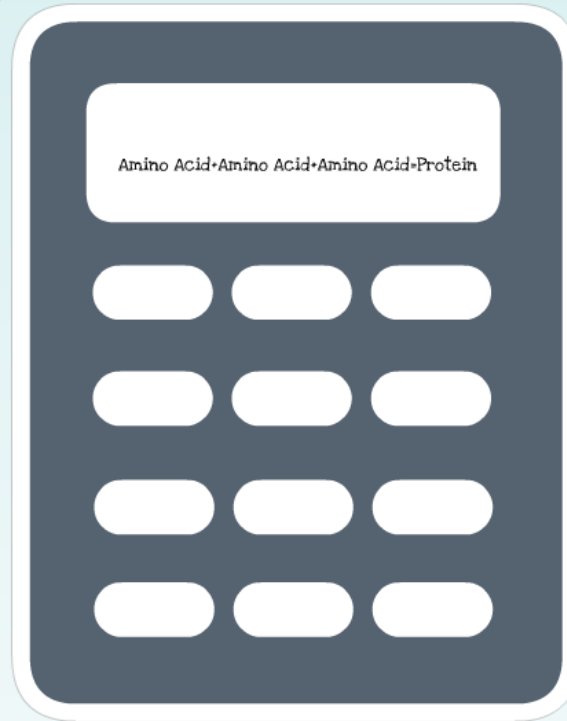


Unsaturated: Double bonds (chemical bonds between 2 chemical elements)

Saturated: No double bonds

# Proteins

VITAL



Supplies structure for organs and tissues; Carries out cell metabolism

Components:  
H, C, N, O, & S

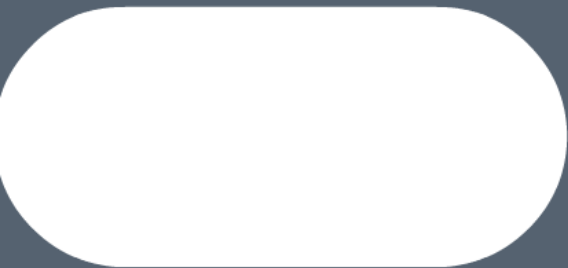
#### Amino Acids:

- Building blocks of proteins
- Linked by peptide bonds
- There are 20 different amino acids

The sequence of the amino acids directly affects the function and shape of proteins.



Amino Acid+Amino Acid+Amino Acid=Protein



## Amino Acids:

- Building blocks of proteins
- Linked by peptide bonds
- There are 20 different amino acids

The sequence of the amino acids directly affects the function and shape of proteins.





incorrect substrate

C. Ophardt, © 2003

# Enzymes

Specialized proteins

Carry out or catalyze (speed up) reactions taking place in the body or cells.

Usually end in -ase or -in

Example: amylase, pepsin

## HOW?

Enzymes catalyze reactions by decreasing the activation energy

\*\*Enzymes work best at certain temperatures and pH only\*\*



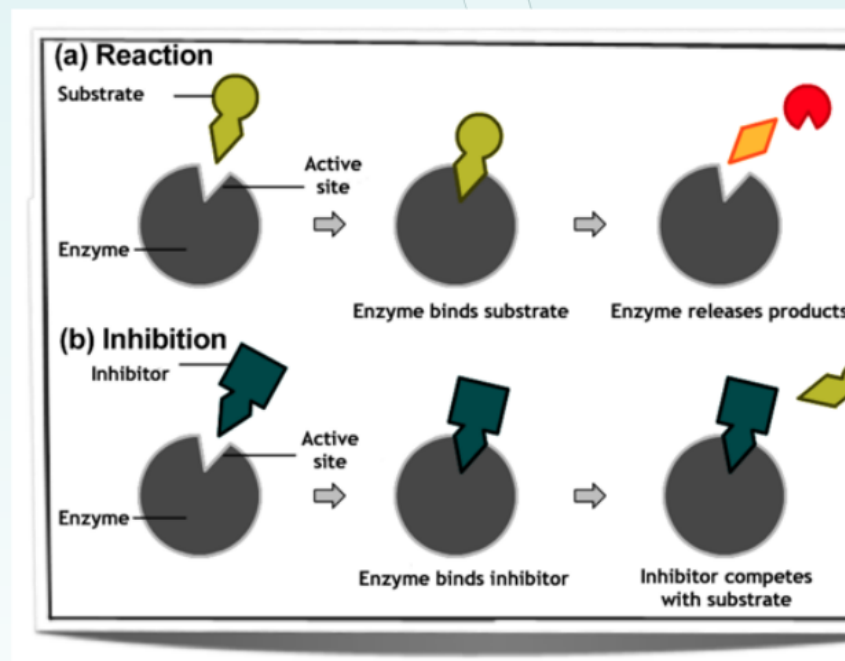
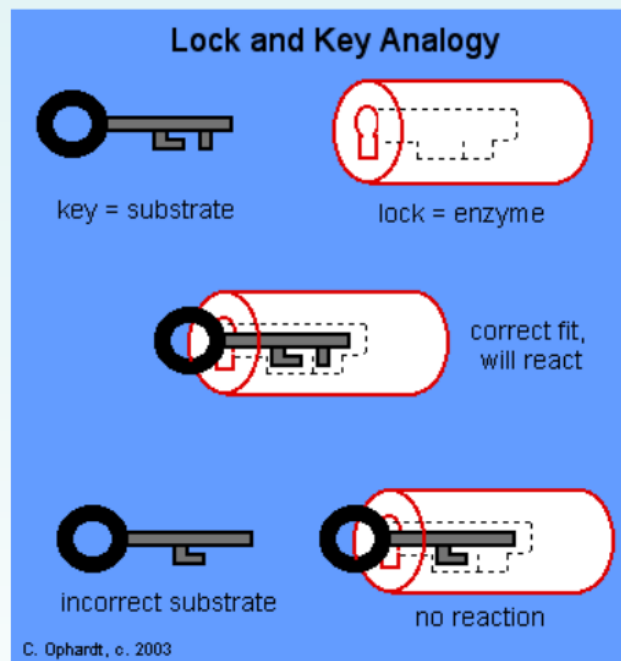
e: amylase, pepsin

HOW?

Enzymes catalyze reactions by decreasing the activation energy

\*\*Enzymes work best at certain temperatures and pH only\*\*

# Lock and Key Theory:



# Nucleic Acids

Conveys genetic information

Vital roles:  
Binding, decoding, regulating, and  
expression of genes.

Nucleic Acids stores  
and transmits in the  
form of 'genetic  
code'

Composed of Carbon, Oxygen, Hydrogen, Nitrogen, and Phosphorous.

Main Forms:

- DNA
- RNA
- ★mRNA, tRNA, rRNA



Polymer

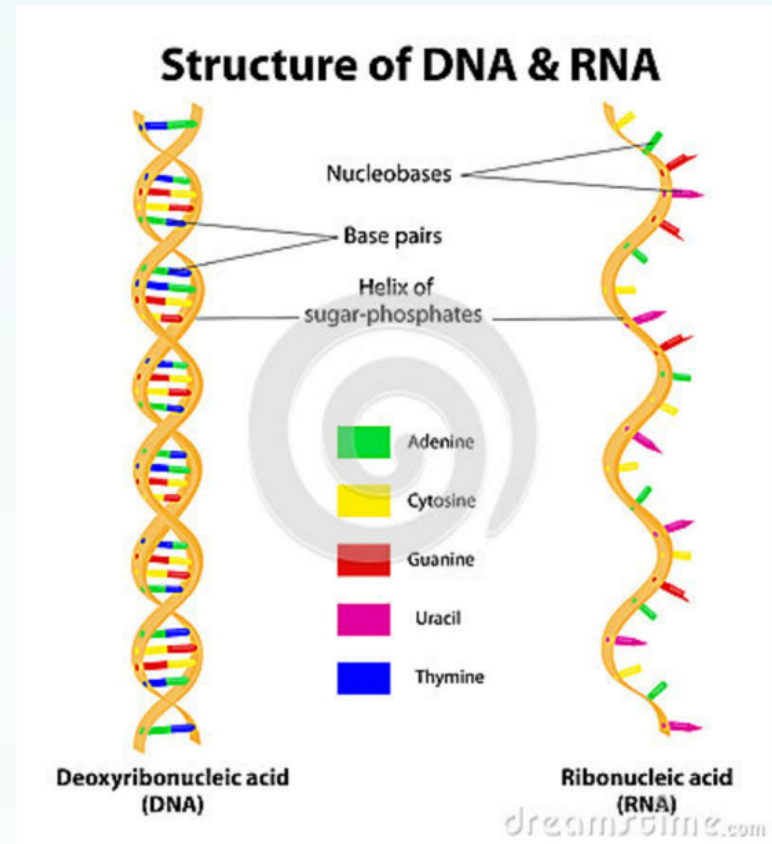
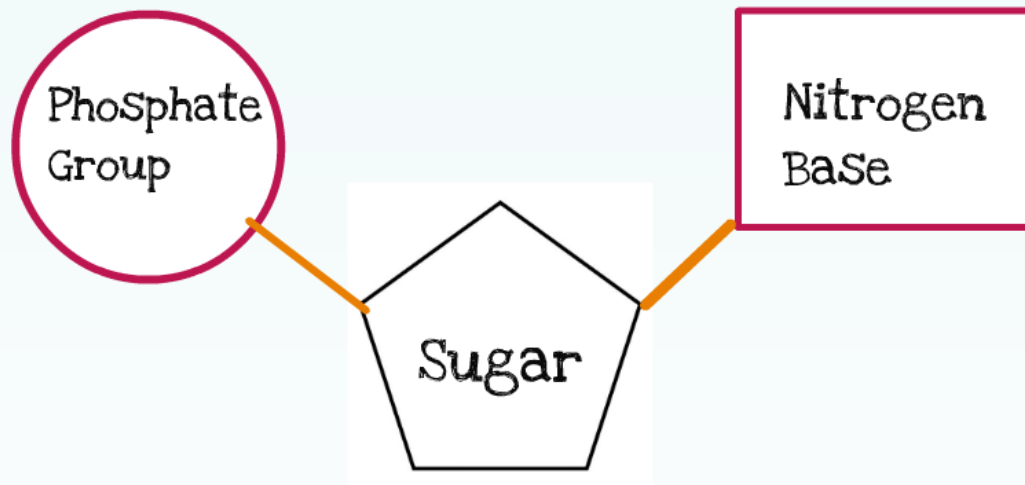
Nucleotide:

Phosphate  
Group

Su

Double Stranded:    Single Stranded:

Nucleotide:



## Dehydration Synthesis:

- When compounds come together, they lose water.
- Example: monomers join together to form a polymer

## Hydrolysis:

- water is added to a molecule to break it down.
- Example: breaking up polymers